feet, the culminating point of the whole province being apparently the Gu-Koh peak (6,400 feet) in the Parment district.

A survey of the Ab-washur water-parting, between Bashkurd and Hormuz Strait, considerably reduced the supposed eastward extension of the Minâb basin, and showed conclusively that it was in no way connected with the Bampur River, which many geographers have hitherto made to discharge through the Minâb into the Persian Gulf. Mr. Floyer now argues with much force that the true outlet of the Bampûr is the Sadîch (Sadaich), which reaches the coast in 58° 40′ E., in the Gulf of Omân, and which seems to flow from the Shahri country, through the Shimsani Pass, in the Band-i-Marz range. He found that where he crossed the Haliri in 28° N., 57° 40′ E., it was already a considerable stream, 90 feet broad, and 4½ feet deep. The furthest head-waters of this important river, of which next to nothing was previously known, are in the Jemal Bariz range, whence it flows in a south-easterly direction to the Rudbar and Shahri districts. Here it would be almost necessarily joined by the Bampûr River, coming from the north-east, and the united stream, whose further course has hitherto remained an unsolved problem, would appear to flow thence through the Shimsani Pass southwards to the Sadîch. Hence the Sadîch would seem to be the lower course of the Haliri-Bampûr, thus draining nearly the whole of the region in south-east Persia, between 57°–61° E., and 25° 30′–29° N. But this interesting point cannot, of course, be finally determined without a more thorough exploration of the Rudbar and Shahri districts between Bampûr and the Ab-washur water-parting.

The work, whose chief fault is its misguiding title, is written in a pleasant, vivacious style, and contains much useful information touching the ethnical, social, and linguistic relations of the Balûchi tribes on the Perso-Mekrân frontier. A. H. KEANE

A Synopsis of Elementary Results in Pure and Applied Mathematics: containing Propositions, Formulæ, and Methods of Analysis, with Abridged Demonstrations. By G. S. Carr, B.A. Vol. i., Section ix. (London: C. F. Hodgson and Son, 1882.)

IN our notices of the previous sections we have sufficiently indicated the scope of this work. The present section is devoted to the integral calculus, and takes up its numbered articles at 1900, and closes at 2997: the pagination being pp. 313–440 of part ii. of vol. i. The same honest work, for which we have already commended the author, is conspicuous here, and the utility of having such a handy manual on the calculus is evident. It would be impossible to furnish here the results of a thorough examination of the text; the preparation for such a task would take up a very long time; but we would recommend a testing of the several parts to which a reader may have occasion frequently to refer, so that the book might be consulted with full confidence. We are glad to find that the likelihood of the occurrence of such errors as we mentioned in our notice of the first part, is reduced to a minimum by the very careful method of revision now adopted by Mr. Carr. We have much pleasure in commending this new section to the notice of our mathematical readers.

A Collection of Examples and Problems on Conics and some of the Higher Plane Curves. By Ralph A. Roberts, M.A. (Dublin: Hodges, Figgis, and Co., 1882.)

THESE Examples will serve as an excellent compendium of results to a student who is working through Dr. Salmon's Treatises on Conic Sections and on the Higher Plane Curves. In fact it was whilst the author was reading the above-named works that he conceived these useful illustrative exercises. Mr. Roberts shows himself to be an apt mathematician, and to have a very extensive acquaintance with the classes of curves considered. These are mostly curves of the second, third, and fourth orders. The Problems have been, in general, suggested by Dr. Salmon's treatises and by Dr. Casey's Memoir on Bicircular Quartics: Mr. Roberts also acknowledges his indebtedness to Darboux's Sur une classe remarquable de courbes et de surfaces algébriques. Occasional explanatory matter is thrown in here and there, and concise proofs are given in several cases. As the text-books contain a limited number of examples, this work will be a useful supplement to them. We like almost everything about the book except the paper, and that appears to us to be of a very inferior character.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Recent Unseasonable Weather

IN view of the recent unusually cold weather in England and Scotland, which has been so well described and proximately explained in last week's NATURE, the following paragraph, extracted from the *Standard* of June 15, appears to me highly suggestive, especially as regards one of the probable causes for the "unwonted high pressures" on the northern side of the depression which is accused of being the immediate source of these unseasonable conditions:—

"News from Iceland states that the Spitzbergen floe-ice surrounds the north and east coast, entirely preventing navigation. A Norwegian steamer endeavouring to reach Bernfiord, on the south-east coast, last week, was caught in the ice and had to put back. Owing to the presence of these immense ice-fields vegetation has made no progress, causing a great loss of horses and sheep through starvation. Epidemics of measles and small-pox have been introduced into the island from Europe, and are making extensive ravages among the population; the former is especially prevalent in Rejkjavik."

Now it has been ascertained with some considerable degree of certainty by Messrs. Blanford and Eliot, the Government meteorologists in India, that a heavy winter snowfall over the North-west Himalaya exercises a marked and prolonged influence in lowering the temperature and elevating the atmospheric pressure and thereby directly affecting the winds and weather, over the whole of Northern India, and parts of Central India; and indirectly to a much greater distance. Turning to Europe, we find the distance from Rejkjavik, on the west coast of Iceland to London is about 1140 miles, or about the same as from Lahore to Calcutta (1080 miles), while from Cape Horn on the east coast of Iceland to Edinburgh the distance is only 750 miles, or about the same as from Calcutta to Agra. To any one familiar with Indian weather charts or the meteorology of that country, it would appear absurd not to attempt to correlate the meteorological conditions at places so comparatively near as the above-mentioned towns; and in fact experience has shown that the meteorology of the Punjâb is not only intimately connected with that of Lower Bengal, but also with that of Southern India. If therefore it has been found that an abnormally heavy snowfall in the North-West Himalaya, such as that which characterised the winters of 1876-77 and 1877-78, exercised a marked effect on the meteorology of Northern India, which was felt at places situated 1000 miles or more from the seat of action, may it not be reasonably inferred that the presence of a large mass of ice or snow in the Icelandic area would be likely to give rise to similar atmospheric conditions over these islands? It seems therefore not at all improbable, that the abnormal weather during the past few weeks may be directly due in some considerable measure to the coincident appearance of large masses of ice off the eastern coasts of Iceland, like those which, from the account in the *Standard*, appear to be at present prevailing to an unusual extent.

In the case of India an abnormally heavy fall of snow in the

Himalayan zone is found to be associated, not only with the subsequent conditions already named, but also with an *initially*, and therefore according to experience *subsequently* weak south-west monsoon, which in its turn invariably causes local, if not general drought and famine. These heavy snowfalls are found to have a tendency to recur at the minimum sun-spot epochs, and are proximately due to some condition of the upper anti-monsoon current, at present not exactly known, by which a larger amount of vapour is deposited in the winter, on the Himalaya as snow, and on the North Indian plains as the "winter rains."

It does not appear that we can so readily account for the occurrence of the present ice-floes off Ireland or for the large masses which have been encountered this spring in the Western Atlantic. They must however to some extent be due to the unusually warm winter which seems to have prevailed pretty uniformly over the North Atlantic and North-West Europe, and which has detached a larger proportion than usual of the Arctic ice-fields. And though it is improbable that we shall find any such regular periodicity in the amount of these ice-floes in the Atlantic as in that of the Indian winter snows and rains, it is worthy of notice to observe that they have a decided tendency to occur to an unwonted extent about the times of maximum sun-spot—like the present. Thus Prof. Fritz, of Zurich,[1] gives the following as the list of years in which floating ice was found most abundantly in the lower latitudes of the North Atlantic :—

Years of greatest frequency of floating ice.	Epochs of maximum sun-spot.
1789	1788·1
	1804·2
1816–18	1816·4
1828–29 }	1829 9
1831 }	
	1837·2
	1848·1
1862–64	1860·1
1868 }	1870·6
1869 }	

It is also interesting to notice that in 1862 Heis's "Wochenschrift" mentions that the floating ice-masses in the Atlantic caused "a noticeable cooling of the weather in *June* over Europe." And it is further significant to find in a detailed list of the ice met with every month in the Atlantic by ships belonging to the North German lines from 1860 to 1869, that 1868 and 1869 (the year in which similar weather to the present is mentioned as having been observed by the writer of the paragraph in NATURE) were the years in which the greatest quantity of ice was encountered. Though I agree with Dr. Hann in attributing more importance to the *tropical* than to the *polar* area, in influencing the *general* weather of these latitudes, I think it very probable on theoretical grounds that we are relatively more influenced by the *latter* area in *summer* and by the *former* in *winter*, and that just as it has been inferred that the regular recurrence of periods of diminished temperature in Europe, is due to the regular movements of the ice in the polar area so we may reasonably conclude that abnormal movements of the ice, especially in the Spitzbergen area, are likely to produce periods of abnormal coolness such as that which at present prevails. In any case the moral to be drawn, if we really do intend to solve the weather problem, is by all means to have a meteorological station in Iceland, and endeavour to study the weather as we are fortunately able to do in India, on a *large scale*, instead of merely confining our attention to the minute range of conditions we are able to observe within the limited area of these islands.

E. DOUGLAS ARCHIBALD

The Analysis of the Tuning Fork

IN NATURE last week there is a short description of Mr. W. F. Stanley's well-devised experiments, by which the tuning-fork "is shown not to depend upon a vibrating ventroid."

Few persons would readily obtain the experimental steel rod, or would care to attempt the feat of sawing through the bend of the fork down into the stem, and some musical readers may like to know that (missing, of course, the pretty effects) there is a less arduous way of arriving at the conclusion to which Mr. Stanley has directed attention. By very simple experiments I have been accustomed to show that Chladni's analysis, as generally accepted, is not in all particulars borne out by the evidence of facts. If a vibrating tuning fork is held in its upright position by means of a knife-blade passed through the prongs, pressing upon the inner bend so that the stem is in contact with the table, without its being held by the fingers, there will be a communication of vibrations fully as strong as when held in the usual manner, with variation of intensities according to differences in the degrees of pressure. In this experiment the fork at its bend is subjected to pressure both above and below. The argument, therefore, is that the existence of a segment in transversal vibration, occupying the bend of the fork as figured in Chladni's analysis, is incompatible with the evidence. As in all musical instruments, the communicating of transversal vibrations from one solid to another is invariably through the nodes, and as segments are always destroyed by firm pressure, it seems clear that the analysis should be amended. If a vibrating fork is drawn across a stretched string with pressure, the prong passing from the bend towards the point or end, the integrity of the vibrations of the fork is not impaired, and there is but a slight transference of vibration to the string; but it is otherwise with respect to a stretched wire, as when the prong comes into contact with the wire, its vibrations cease; the wire will not be subordinated to the coercive activity of the prong as the string is; yet if the fork is placed with the prongs astride the wire, so that the bend, at the seat of the alleged segment, rides upon the wire, the wire readily conveys the vibrations, and acts as a sound-post. It may be shown that the stem of the fork acts likewise as a sound-post, since we may substitute a free stem; if a vibrating fork is held by the stem, and if through the prongs another fork has the shoulder of its stem pressed upon the bend, then, when the point of this second stem is brought into contact with a solid, the vibrations of the fork are transmitted through it from the bend, with nearly the strength of tone as would be produced by the original fixed stem. The stem itself may be dispensed with as a part of the system, for if the fork is held so that the external part of the bend, where it joins the stem, is pressed against the edge of a table or other solid, its vibrations are not interfered with; neither is the strength of tone diminished, except as in each of these instances, varying in the usual way according to the degree of pressure. HERMANN SMITH

June 19

"Combing" of Waves

ALL who have watched waves breaking on the sea-shore must have noticed the furrowed or "combed" appearance of the back of a wave as it curls over. If the water is not much disturbed by wind, it is seen, on attentive watching, that this "combing" appears suddenly, and begins at the advancing edge of the crest, and spreads backwards. With small waves a foot or so in height and of long extended front, such as are seen in shallow water, it may be observed that the crest, which in this case rolls down the front of the wave, is at first smooth and even, while the back of the wave is also smooth and unfurrowed, but the edge of the crest suddenly becomes crenated, and almost simultaneously the combing appears on the back of the wave, travelling rapidly backwards from the crenated edge. Moreover a considerable length of the wave appears to be similarly affected almost at the same instant. With larger waves, whose crest falls rather than rolls upon the concave front, I have observed that the edge is at first smooth and even, but that it suddenly becomes uneven, and often fringed with a row or rows of drops, and that at the same instant the combing appears. In both cases, if there is much wind, the regularity of the phenomenon is disturbed, and observation is in other ways rendered difficult. The action is so exactly parallel to something which takes place in the splash of drops, and which I have described in detail in a paper recently read before the Royal Society (see *Proc. Roy. Soc.*, No. 218), that I think your readers may be interested in a brief statement, with special reference to this more familiar case of waves, of the explanation there put forward. The explanation amounts to this :—It is well known that a long cylinder of liquid is unstable, and will, if left to itself, at once tend to split into a row of equal, equidistant drops; the splitting being effected by a constriction of the cylinder in certain places, and a bulging out in others. Again, if a mass of liquid is bounded by an edge whose surface is approximately a portion of a long cylinder, there is good reason for supposing that this cylindrical edge will be subject to similar laws of stability, and that it will tend to cleave in the same way, the surface being forced in in certain places, and out in others. Now a wave's crest presents such a cylindrical edge.

[1] In his work, "Ueber die Beziehungen der Sonnen flecken-periode zu den Meteorologischen und Magnetischen Erscheinungen," p. 175.